US007490109B1

(12) **United States Patent**
**Sikchi et al.**

(10) **Patent No.: US 7,490,109 B1**
(45) **Date of Patent: *Feb. 10, 2009**

(54) **SYSTEM AND METHOD FOR OFFLINE EDITING OF DATA FILES**

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( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 337 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/276,585**

(22) Filed: **Mar. 6, 2006**

**Related U.S. Application Data**

(63) Continuation of application No. 10/395,490, filed on Mar. 24, 2003, now Pat. No. 7,370,066.

(51) **Int. Cl.**
***G06F 17/30*** (2006.01)

(52) **U.S. Cl.** ..... **707/200**; 707/1

(58) **Field of Classification Search** ..... 707/1, 707/104.1, 4, 100, 200; 717/100, 101, 121
See application file for complete search history.

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(57) **ABSTRACT**

A system and method that enables a user to edit a data file offline is described. This system and method can enable a user to edit a data file without the user having to discover or deploy a solution application governing the data file. For security, this system and method can deploy a solution application within a sandbox, thereby limiting the operations the solution application can perform.

**19 Claims, 5 Drawing Sheets**

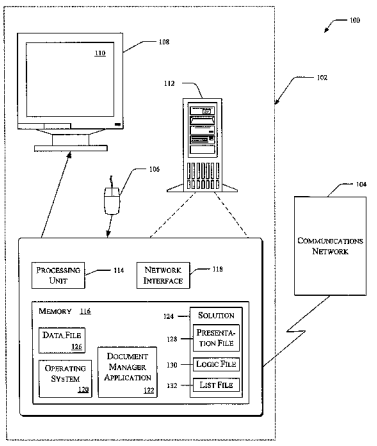

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Fig. 1

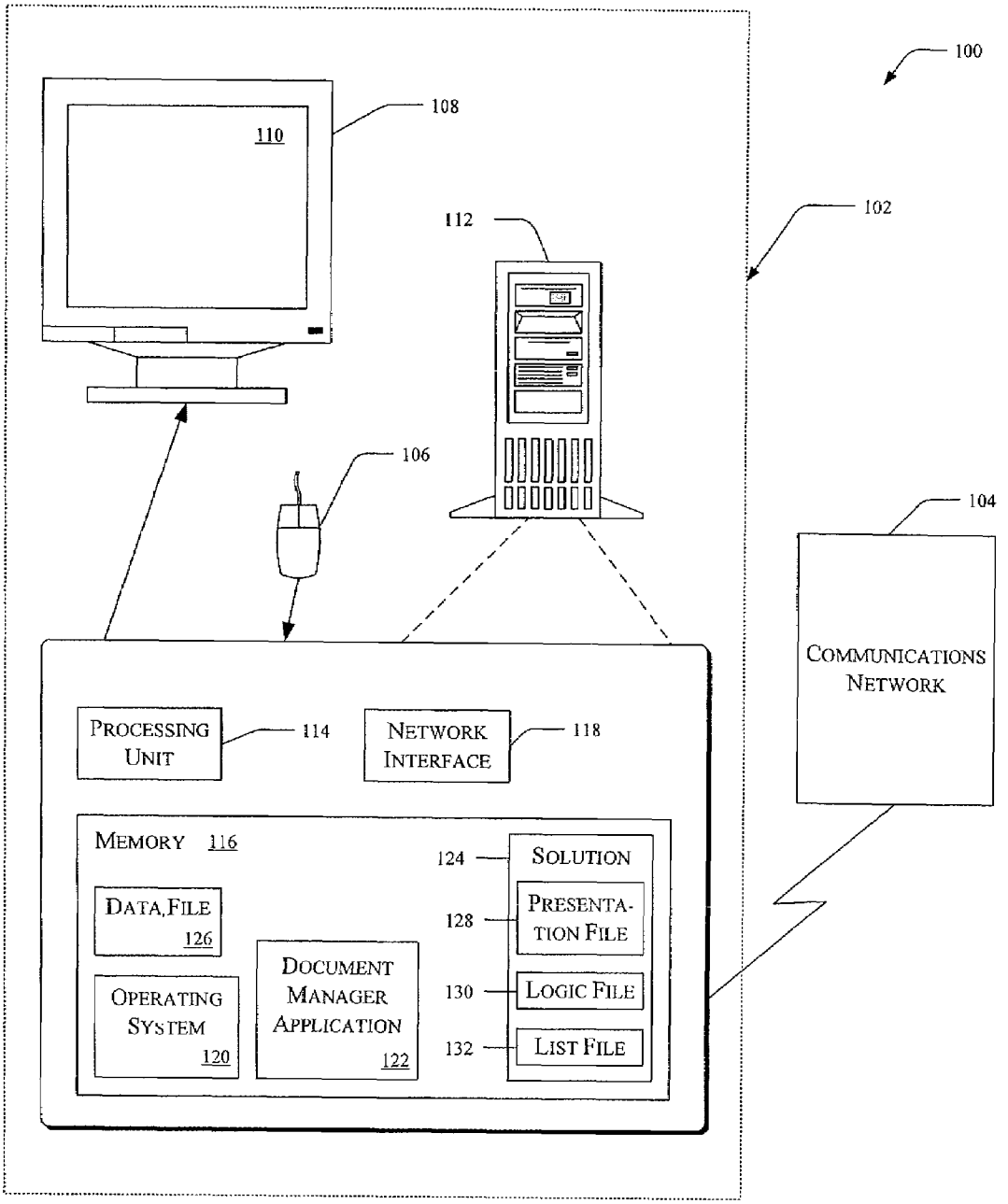

100
108
110
102
112
106
104
COMMUNICATIONS NETWORK
PROCESSING UNIT
114
NETWORK INTERFACE
118
MEMORY 116
124
SOLUTION
DATA FILE 126
128
PRESENTATION FILE
OPERATING SYSTEM 120
DOCUMENT MANAGER APPLICATION 122
130
LOGIC FILE
132
LIST FILE

Fig. 2

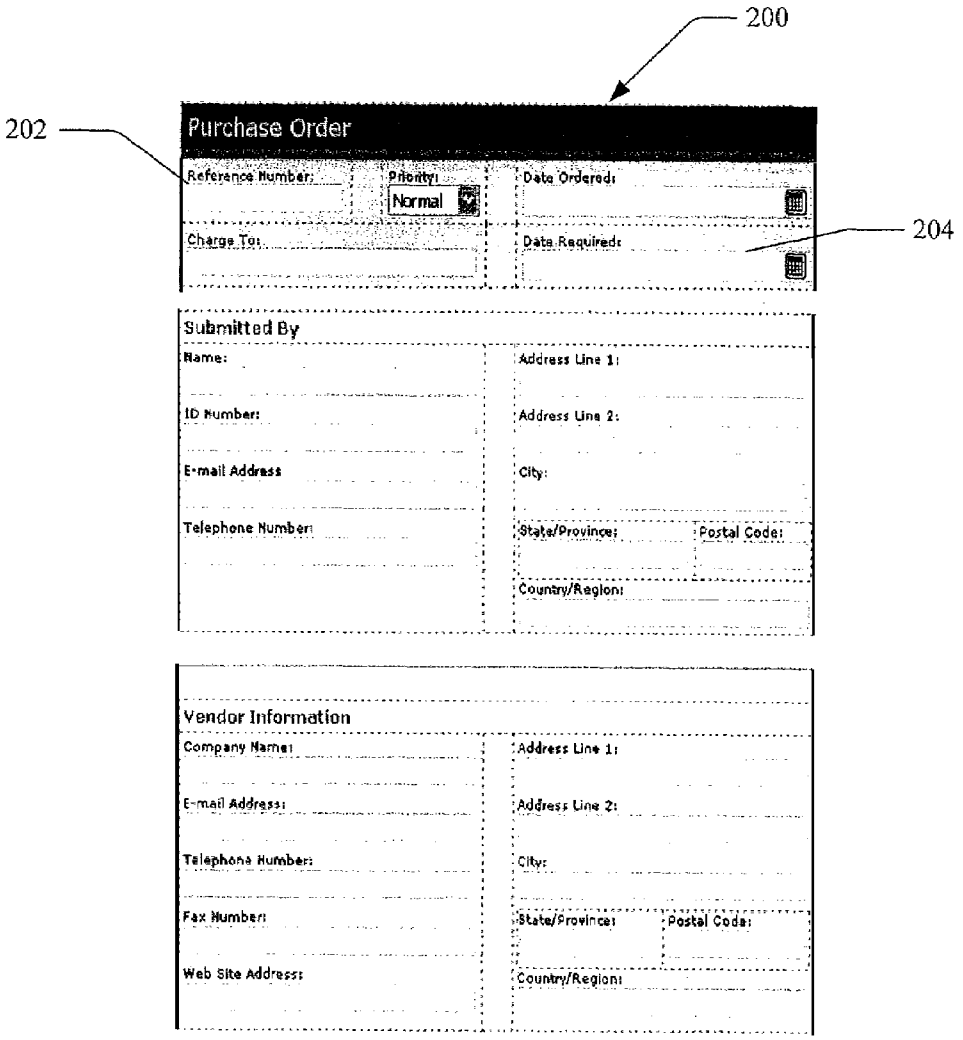

200
202
204
Purchase Order
Reference Number:
Priority:
Normal
Date Ordered:
Charge To:
Date Required:
Submitted By
Name:
ID Number:
E-mail Address
Telephone Number:
Address Line 1:
Address Line 2:
City:
State/Province:
Postal Code:
Country/Region:
Vendor Information
Company Name:
E-mail Address:
Telephone Number:
Fax Number:
Web Site Address:
Address Line 1:
Address Line 2:
City:
State/Province:
Postal Code:
Country/Region:

Fig. 3

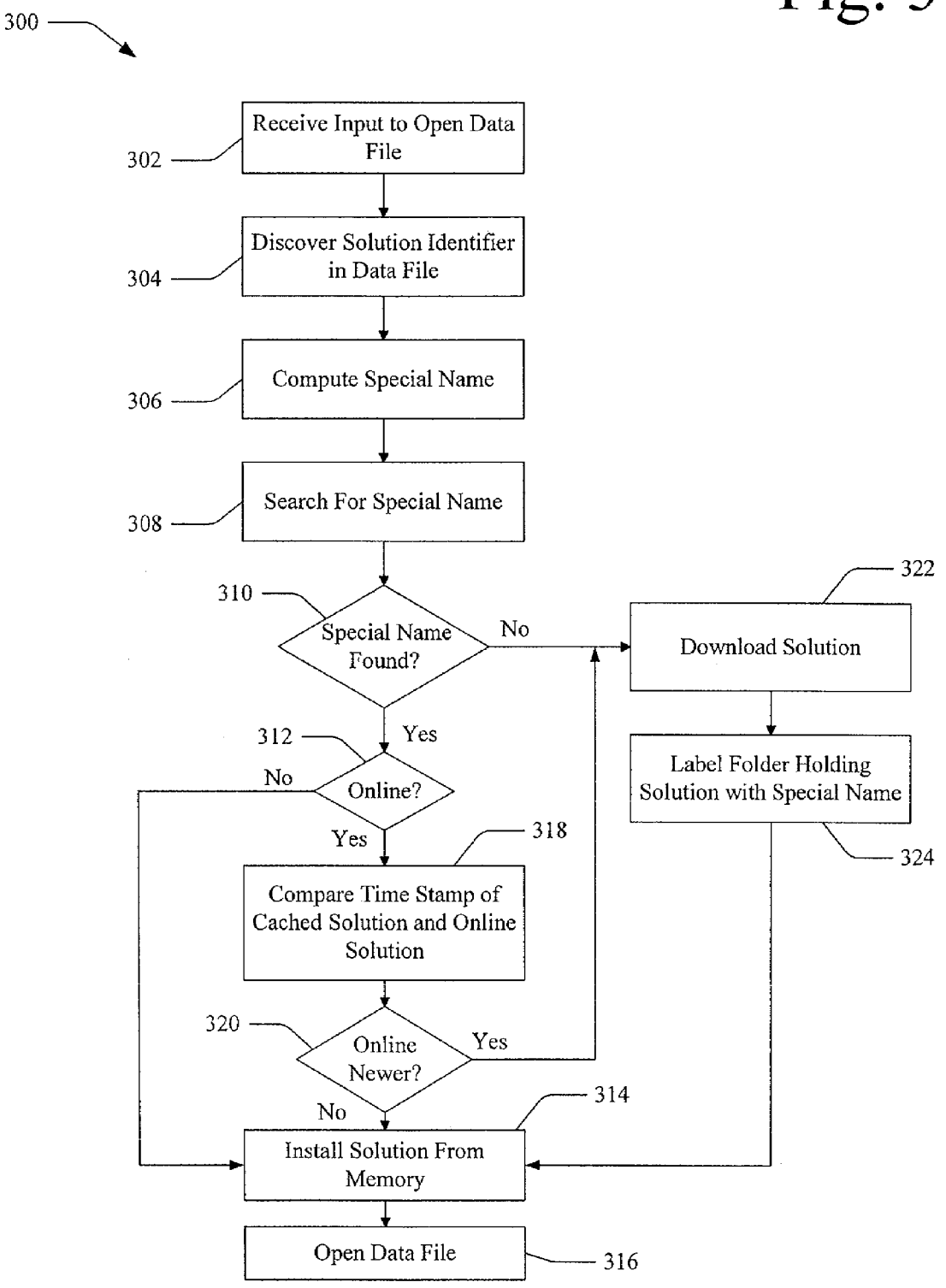

300
Receive Input to Open Data File
302
Discover Solution Identifier in Data File
304
Compute Special Name
306
Search For Special Name
308
310
Special Name Found?
No
322
Download Solution
Label Folder Holding Solution with Special Name
324
Yes
312
No
Online?
Yes
318
Compare Time Stamp of Cached Solution and Online Solution
320
Online Newer?
Yes
No
314
Install Solution From Memory
Open Data File
316

Fig. 4

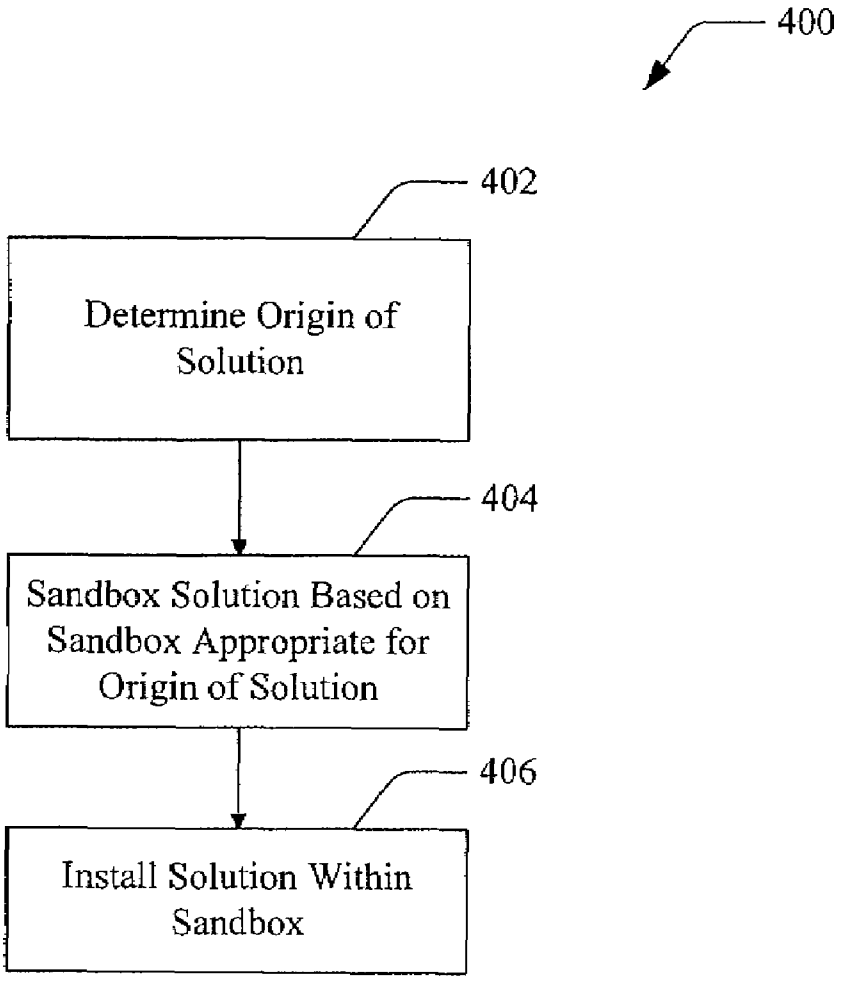
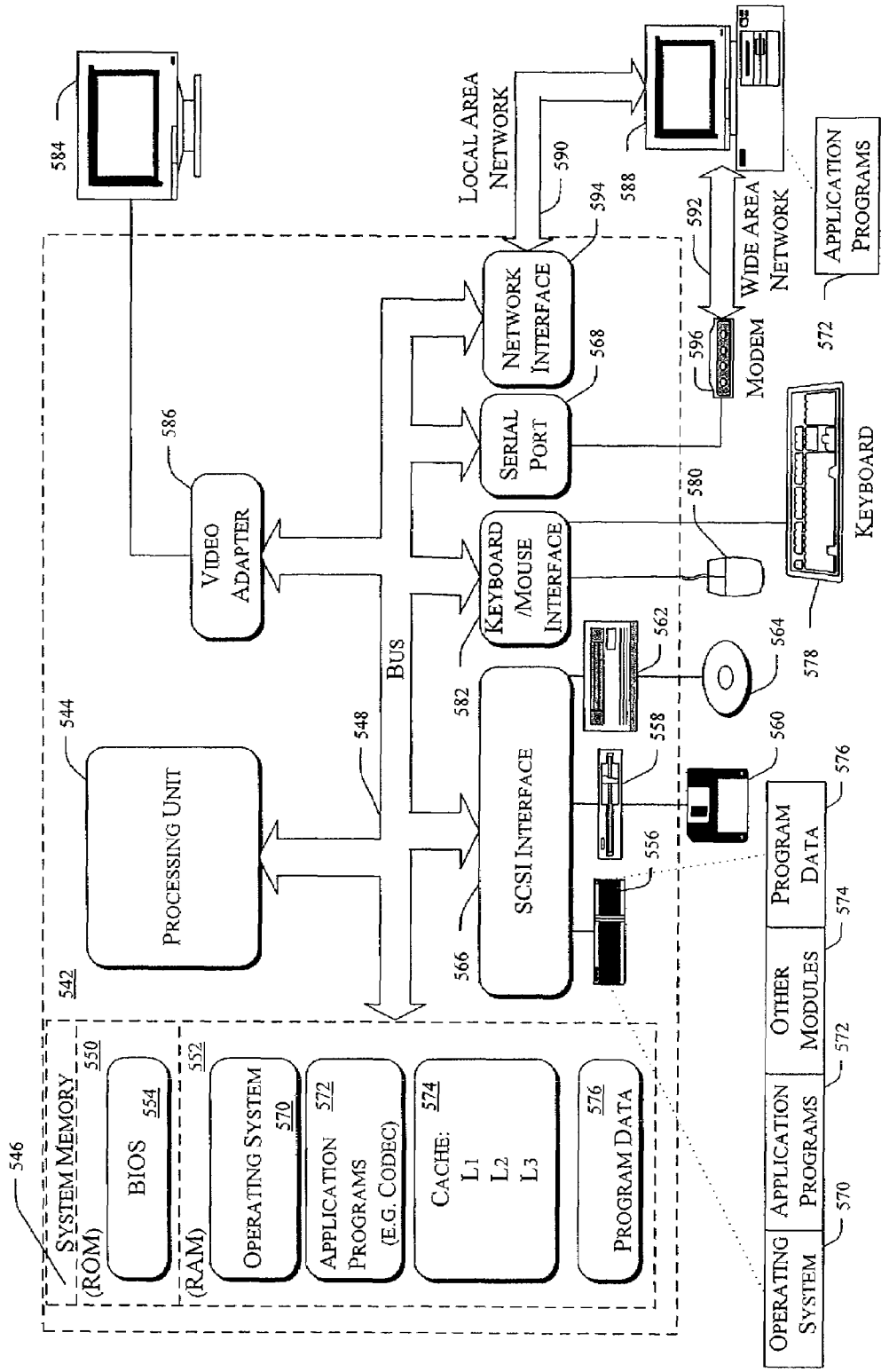

400
402
Determine Origin of Solution
404
Sandbox Solution Based on Sandbox Appropriate for Origin of Solution
406
Install Solution Within Sandbox

Fig. 5


546
SYSTEM MEMORY
(ROM) 550
BIOS 554
(RAM) 552
OPERATING SYSTEM 570
APPLICATION PROGRAMS (E.G. CODEC) 572
CACHE: 574
L1
L2
L3
PROGRAM DATA 576
542
PROCESSING UNIT 544
548
BUS
VIDEO ADAPTER 586
584
SCSI INTERFACE 582
566
KEYBOARD /MOUSE INTERFACE
SERIAL PORT 568
NETWORK INTERFACE
LOCAL AREA NETWORK 590
594
588
592
WIDE AREA NETWORK
MODEM 596
APPLICATION PROGRAMS 572
KEYBOARD 578
580
562
564
558
560
556
OPERATING SYSTEM 570
APPLICATION PROGRAMS 572
OTHER MODULES 574
PROGRAM DATA 576

# SYSTEM AND METHOD FOR OFFLINE EDITING OF DATA FILES

## CROSS-REFERENCE TO RELATED APPLICATIONS

This is a continuation of and priority is claimed to U.S. patent application Ser. No. 10/395,490, a filing date of Mar. 24, 2003, now U.S. Pat. No. 7,370,066 for "SYSTEM AND METHOD FOR OFFLINE EDITING OF DATA FILES" of Sikchi et al. This U.S. patent application is commonly assigned herewith and is hereby incorporated herein by reference for all that is discloses.

## BACKGROUND

Extensible markup language (XML) is increasingly becoming the preferred format for transferring data. XML is a tag-based hierarchical language that is extremely rich in terms of the data that it can be used to represent. For example, XML can be used to represent data spanning the spectrum from semi-structured data (such as one would find in a word processing document) to generally structured data (such as that which is contained in a table). XML is well-suited for many types of communication including business-to-business and client-to-server communication. For more information on XML, XSLT, and XSD (schemas), the reader is referred to the following documents which are the work of, and available from the W3C (World Wide Web consortium): XML Schema Part 2: Datatypes; XML Schema Part 1: Structures, and XSL Transformations (XSLT) Version 1.0; and XML 1.0 second edition specification.

One of the reasons that data files written in XML are often preferred for transferring data is that XML data files contain data, rather than a combination of data and the software application needed to edit the data. One problem with XML data files, however, is that to edit an XML data file, a user needs to first install a solution software application used to access, view, and edit the data file.

When a user is online, his computer can run a host application capable of accessing the Internet, such as Microsoft® Internet Explorer®, which can silently discover and deploy an XSLT, which enables the user to author and access an XML data file.

If a user wishes to save an XML data file for later, offline use, however, the user may encounter various problems. In some cases, a user wishing to reopen an XML data file offline will not be able to do so because he can no longer discover and deploy the XML data file's solution application. The user can no longer discover a solution if he is no longer online and the solution is accessible only online. In other cases, a user can access and deploy the solution application, but to do so the user must proactively discover the solution's name and where on his computer it resides, which a user may not know. And sometimes, a user's host application discovers the solution's name and where it resides, but the user has to instruct his computer to deploy the solution application, rather than the computer automatically opening, the solution file when the user attempts to open the corresponding XML data file.

Even in those cases where a user can continue to author and access an XML data file offline by actively installing the XML data file's solution application, there often is another problem. When a user instructs his host application to open a solution for an XML data file, his host application may trust the solution, thereby setting the user's computer at risk. A solution originally accessed online could, for instance, contain a virus or worm. When the user instructs his host application to install the solution, it could introduce the virus or worm.



For these reasons, editing data files offline can be inconvenient and dangerous.

## SUMMARY

The following description and figures describe an offline editing tool enabling offline editing of a data file with silent discovery and deployment of the data file's solution. This offline editing tool enables a user to edit data files by performing certain actions before the user attempts to edit the data file while offline. When a user first opens a data file when online, for instance, the editing tool can download the data file's solution into a cache for later retrieval.

The offline editing tool follows appropriate security precautions to contain possibly dangerous code in a data file's solution even when the solution is installed from a local source, such as when a user is offline. This offline editing tool determines what level of security is appropriate for a data file's solution based on the original source of the solution.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a communications network and a system capable of implementing a method for offline editing of data files.

FIG. **2** illustrates an exemplary electronic form whereby a user can edit a data file.

FIG. **3** is a flow diagram of an exemplary process for editing of data files while online or offline.

FIG. **4** is a flow diagram of an exemplary process for offline editing of a data file with security by sandboxing the data file's solution application.

FIG. **5** is a block diagram of a computer system that is capable of supporting secure online and offline editing of data files.

The same numbers are used throughout the disclosure and figures to reference like components and features.

## DETAILED DESCRIPTION

The following disclosure describes an easy, simple, and secure way to access data files when offline. If a user has opened a data file first online, or if the system has otherwise received the data file's solution, a document manager application can silently discover and deploy a data file's solution. The document manager allows a user to simply select a data file to open and the document manager will open the data file with a discovered and deployed solution. The user need not discover, select, or even be aware that the data file requires a solution for the data file to be edited. After selecting the data file to open, the user can then edit and access the data file in a way very similar to how it would act and appear had the user opened the data file while online.

### Data Files, Solutions, and Host Applications

Data files, their solutions, and a host application work together to allow a user to open and edit the data file. Data files contain little or no operable code, where as a solution file containing presentation and logic applications. Because editing a data file requires a solution, if a user tries to open a data file without a solution, she could get a error, a prompt asking the user to open a solution, or perhaps a flat list of the data in the data file.

To view and edit a data file then, the data file's solution is needed. A data file's solution application is one or more files that, when installed, are used to enable a user to view, access, and edit the data file.

In addition to the data file and its solution, a host application is needed. This application works to enable the solution to function fully. In this description, a document manager application is described, which is capable not only of acting as a host application (allowing a solution to function properly), but can also allow a user to open a data file without actively finding and installing the data file's solution.

For discussion purposes, the system and method described herein are described in the context of a single computer, a communications network, a user-input device, and a single display screen. These devices will be described first, followed by a discussion of the techniques in which these and other devices can be used.

Exemplary Architecture

FIG. **1** shows an exemplary architecture **100** to facilitate online and offline editing of data files. This architecture **100** includes a computing system **102** connected to a communications network **104**. The system **102** is configured to go online and communicate via the communications network **104** to gain access to non-local information sources, such as sources on an intranet or global network. Alternatively, the system **102** can remain offline, where it utilizes local resources without communicating over the communications network **104**.

The computing system **102** includes a user-input device **106**, a display **108** having a screen **110**, and a computer **112**. The user-input device **106** can include any device allowing a computer to receive a designer's preferences, such as a keyboard, a mouse, a touch screen, voice-activated input device, a track ball, and the like. With the user-input device **106**, a user can edit a data file by adding or deleting information within a data-entry field on an electronic form, for instance. The user can use the display **108** and its screen **110** to view the data files.

The computer **112** includes a processing unit **114** to execute applications, a memory **116** containing applications and files, and a network interface **118** to facilitate communication with the communications network **104**. The memory **116** includes volatile and non-volatile memory, and applications, such as an operating system **120** and a document manager application **122**. The memory **116** also includes a solution **124** for a data file **126**. The solution **124** is located locally in the memory **116**, but often has a different original source, such as a source on the communications network **104**. The solution **124** contains one or more files, such as a presentation file **128**, logic file **130**, and list file **132**, which will be discussed in greater detail below.

The document manager application **122** facilitates offline editing of the data files **126** and is executed by the processing unit **114**. The document manager **122** is capable of acting as a host application and enabling a user to open the data file **126** without actively finding and installing the data file's solution **124**. Without any user interaction, other than the user attempting to open the data file **126**, the document manager **122** discovers and installs the data file's solution **124**. Thus, the user does not have to do anything but request to open the data file **126**. The user does not have to discover the data file's solution **124**. The user does not have to install the data file's solution **124**. This silent discovery and deployment allows the user to view, edit, and otherwise interact with the data file **126** with just a single request. In addition, the document manager **122** can provide security offline similar to the security that the user typically enjoys when running a solution online.

A view of the data file **126** is depicted on screen **110** through execution of the data file's solution **124**. The solution **124** contains one or more applications and/or files that the document manager **122** uses to enable a user to edit the data file **126**. To edit the data file **126** in a user-friendly way, the data file's solution **124** contains the presentation file **128**, which includes an electronic form. This presentation file **128** gives the user a graphical, visual representation of data-entry fields showing previously entered data or blank data-entry fields into which the user can enter data. Data files often have one solution but each solution often governs multiple data files.

FIG. **2** shows an electronic form **200** entitled "Purchase Order", which is generated by the solution **124**. This purchase order **200** contains data-entry fields in which a user can enter data. These data-entry fields map to the data file **126**, so that the data entered into the form are retained in the data file **126**.

This solution **124** presents an electronic form but also contains the logic file **130** that governs various aspects of the electronic form and the data file **126**. In a reference number data-entry field **202**, for instance, the solution **124** presents the data-entry field as a white box within a gray box, provides a description of the data desired with the text "Reference Number", and contains logic requiring that the user enter only numbers. Thus, if the user attempted to enter letters, the logic file **130** of the solution **124** would not permit the user's entry. The solution **124** could reject it and inform the user of the problem, such as with a sound, flashing error signal, pop-window, or the like.

The logic file **130** is employed in the solution **124** to ensure that the right kind of data is being entered and retained by the data file **126**. A user's business manager attempting to reference purchases with a reference number, for instance, would like the solution **124** to have numbers in the reference number data-entry field **202**; the manager may not be able to determine how an order should be handled if the reference number entered is incorrect because it contains letters.

Similarly, suppose a business manager wants the delivery date for delivery of a purchased product. To require this, the logic file **130** of purchase order **200**'s solution **124** could be constructed to require a date to be entered into a date-required data-entry field **204**. The logic file **130** can be internal to the solution **124**, or can be implied from the data file **126** even if the data file **126** is primarily data. The logic file **130** can also be a schema, such as an XML schema.

A solution can govern multiple data files. The exemplary purchase order **200**, for example, allows one or more users to fill out many different orders. Each time a user fills out a purchase order form, the system **102** can create a separate data file for that order. Often, a user will create many different data files having the same solution. For each data file edited after the first, the system **102** is likely to have the appropriate solution stored in the memory **116**. Thus, if a user previously opened a first data file and later attempts to open a second data file, both of which utilize the purchase order **200** solution, the document manager **122** can silently discover and deploy the purchase order **200** solution to enable the user to edit the second data file. How the document manager **122** discovers and deploys solutions will be discussed in greater detail below.

A solution can be one file or contain many files, so long as the files used to edit data files it governs are included. The solution **124** of FIG. **1** includes the listing file **132**, which is a manifest of all of the other files in the solution **124** and contains information helping the document manager **122** to locate them. The logic file **130** and presentation file **128** can be joined or separate. The presentation file **128** helps the

document manager **122** present or give a view of a form enabling entry of data into the data file **126**, such as a visual representation of the data file **126** by the purchase order **200** electronic form. In some implementations, the presentation file is an XSLT file, which, when applied to an XML data file, generates a XHTML (eXtensible Hyper-Text Markup Language) or HTML (Hyper-Text Markup Language) file. XHTML and HTML files can be used to show a view on the screen **110**, such as the purchase order **200** of FIG. **2**.

A solution, such as the solution **124**, can also include various files or compilations of files, including a manifest file setting forth names and locations for files that are part of the solution **124**. The files within the solution **124** can be packaged together, or can be separate. When separate, the list file **132** acts as a manifest of the files within the solution **124**. The list file **132** can also include other information, such as definitions, design time information, data source references, and the like. When the files are packaged together, the document manager **122** can simply install and execute the packaged solution file for a particular data file. When not packaged, the document manager **122** can read the list file **132**, find the listed files, and install and execute each of the listed files for the particular data file. The list file **132** and the packaged solution file can be interrelated in that an packaged file contains the list file **132** and the list file **132** lists files packaged within the packaged file, although usually only one need be discovered by the system **102** to open a particular data file.

Like solutions, data files can come in various types and styles. As mentioned above, data files can be written in XML or some other mark-up language, or can be written in other languages. Most data files, however, do not contain extensive logic and other files or code. One of the benefits of having data files separate from their solutions, is that is makes the data within them easier to mine. Because the data files are separate from their solution, the document manager **122** makes them easy to open and edit by silently discovering and deploying the solution for the data file.

Data files also are typically concise and data-centered so that the data they contain can be more easily accessed or manipulated by multiple software applications, including software not typically used in a solution, such as an application that searches for a particular type of data and compiles that data into a report. A non-typical application, for example, could be one that compiles a report of all of the purchase orders required to be mailed by a certain date by searching through and compiling the data entered into data files through the date required data-entry field **204** of the purchase order **200** electronic form.

The above devices and applications are merely representative, and other known devices and applications may be substituted for or added to those shown in FIG. **1**. One example of another known device that can be substituted for those shown in FIG. **1** is the device shown in FIG. **5**.

Techniques for Silent Discovery and Deployment of Data File Solutions

Overview

FIG. **3** shows a process **300** for silently discovering and deploying a data file's solution. The process **300** is illustrated as a series of blocks representing individual operations or acts performed by the architecture **100**. The process **300** may be implemented in any suitable hardware, software, firmware, or combination thereof. In the case of software and firmware, the process **300** represents a set of operations implemented as computer-executable instructions stored in memory and executable by one or more processors.

Silent Discovery and Deployment

At block **302**, the system **102** receives input from a user to open the data file **126**. The user may simply click on a icon representing the data file **126** or otherwise select the data file **126** after which the system **102** opens the data file **126**.

At block **304**, the system **102** discovers a solution identifier in the selected data file **126**. This assumes that the data file **126** is one in which the document manager **122** is capable of reading. The document manager **122** can read data files created at some previous time by the user's or another's document manager **122**. In one implementation, the document manager **122** can also read the data file **126** if it is created by another application that builds a solution identifier into the data file **126**.

This solution identifier can give the system **102** an original source for the solution **124**. With an original source for the solution **124**, the system **102** has one manner in which to help determine the proper security appropriate for the solution **124**. How the system **102** and the document manager **122** handle security for a solution **124** is set forth in greater detail below.

The solution identifier is typically a URL (Uniform Resource Locator) or URN (Uniform Resource Name), but can include other types of names and/or locators. URLs give locations and URNs names of resources, such as the solution **124**, which are typically accessible through the communications network **104**. With the solution identifier, the system **102** can determine the original source for the solution **124** (where it first came from) and whether or not the system **102** has seen the solution **124** before.

In one implementation, the solution identifier is part of a processing instruction included within the data file **126**. This processing instruction is often part of data files and can include various instructions to host applications, such as the document manager **122**. Processing instructions, while not strictly data, do not rise to the level of an applet or application typically included in a solution for a data file. For data files written in XML, for instance, the processing instructions are usually not written in XML, but rather are just a piece of information commonly included. A processing instruction in an XML data file can look like "<? mso-infoPathSolution solutionVersion="1.0.0.3" PIVersion="1.0.0.0" href="http://xdsp04-neten/MiladinP/Forms/template.xsn" ?>". This processing instruction give the document manager **122** a solution identifier, which here gives the original source for the solution for the data file. This solution identifier includes a URL indicating that the original location for the solution is at a remote server accessible by accessing the communications network **104** through the network interface **118**.

One of the advantages of the document manager **122** is that it enables a user to open the data file **126** without the user needing to discover the data file's solution **124**, install the solution **124**, or even know that the solution **124** exists. This system and method enables users to open data files simply and easily and in many cases enables them to edit a data file offline that they would otherwise not have been able to edit.

With the solution identifier, the system **102** computes a special name for the solution **124** (block **306**). This special name is designed to be a name easily found only by the document manager **122**. The special name, because it is computed and findable by the document manager **122** but is not intended to be discoverable by other applications, allows for greater security in downloading possibly hostile solutions from the communications network **104**.

In one implementation, the document manager **122** takes the solution identifier and computes a unique special name for the solution identifier. This unique special name is repeatable;

the next time the document manager **122** computes a unique special name for the same solution identifier, the same unique special name will be created. By so doing, the document manager **122** can find a previously downloaded solution by computing the unique, special name and then searching for the unique, special name to determine if the solution is available locally for offline use (such as by having the solution stored in the memory **116**).

In another implementation, the document manager **122** computes a unique special name by computing a hash, such as a Message Digest 5 hash (MD5 hash), of the solution identifier. By computing a one-way hash of the solution identifier, the document manager **122** creates a unique, special name that is a file of 128 bits from the digits of the solution identifier. Because the file of the unique, special name is 128 bits long, it is very difficult for another application, such as one designed to damage a computer or its files, to determine if the solution **124** is on the computer (cached or available offline) and access the solution **124**. With this hash-based special name, the document manager **122** provides additional security for the system **102**.

The system **102** uses the special name, which corresponds to a solution identifier and thus the data file's solution **124**, to search through locally accessible sources for the solution **124** (block **308**). The system **102** may, for instance, search files and folders in the memory **116** of FIG. **1** for files and/or folders with the same name as the special name computed in the block **306**.

When the Special Name is Found

If the system **102** finds the special name (i.e., the "Yes" branch from block **310**) the solution **124** was saved earlier in the system **102** searched locally in the block **308**. Thus, when the special name is found, the system **102** knows that the solution **124** referred to in the data file (which the user is attempting to open) is accessible offline by the system **102**. The solution **124** is usually stored in the memory **116** but can be stored in other searchable, local sources that the system **102** does not have to go online to find.

The solution **124**, stored at the source and found using the special name, may not be current, however. Because of this, the system **102** determines whether or not the system **102** is online or offline (block **312**). If online (i.e., the "Yes" branch from block **312**), the system **102** will attempt to determine whether or not a more up-to-date solution should be installed (discussed below); if offline, the system **102** will proceed to install the locally stored solution **124** (block **314**).

If the Solution is Found and the System is Offline

If the solution **124** is found and the system **102** is offline, the system **102** proceeds to install the solution **124** from the memory **116** or another locally accessible source (block **314**).

The system **102** installs the solution **124** silently in that the suer does not need to known that the solution **124** was discovered, found, or being installed. Thus, the system **102** enables a user to edit the data file **126** when offline by silently discovering and deploying the data file's solution **124**.

In one implementation, the system **102** installs the solution **124** and then opens the data file **126** in such a manner as to mimic how the data file **126** would be opened had the user opened the data file **126** with the solution accessible online, such as through opening the data file **126** with Microsoft® Internet Explorer®. The system **102** does so to make opening and editing the data file **126** as comfortable for the user as possible, because many users are familiar with opening data files online. One possible difference, however, is that if the system **102** has a slow connection to the communications network **104**, the document manager **122**, by installing the solution **124** from a local source like the memory **116**, may more quickly open the data file **126** than if the user were online.

Also in block **314**, the document manager **122** can install the solution **124** for the selected data file with certain constraints for security, which will be discussed in greater detail as part of a process **400** of FIG. **4**.

In block **316**, the system **102** opens the data file **126** to enable the user to edit the data file **126**. One example of an opened data file (and solution) enabling edits is the purchase order **200** of FIG. **2**. In this example, the user is able to edit the data file **126** by adding, deleting, or changing data in data entry fields (like the reference number data-entry field **202** and the date required data-entry field **204**) even though offline.

Following the previous blocks, a user can easily open a data file offline without having to discover or deploy the data file's solution. This enables users, for example, after first opening a solution online, to open a data file offline. A user can open a data file online and edit it by adding a reference number through the reference number data-entry field **202** of the purchase order **200** electronic form and then stop editing the data file (the data file would contain the added reference number by the system **102** adding the reference number to the data file). The user could then go offline, such as by taking his or her laptop on a business trip, and complete filling out the electronic form. Or the user could send the partially filled-out data file to another user to fill out the rest of the electronic form, which the other user could do so long as the other user's system contains a stored solution. This flexibility allows users and businesses a greater ability to use information by keeping data and solutions separate and by allowing offline use of data files.

If the Solution is Found and the System is Online

Assuming the system **102** finds the special name and the system is online, the system **102** will attempt to determine whether the current solution is the most recent version or a more up-to-date solution is available. In block **318**, the system **102** compares the time stamp of the stored solution **124** and the online solution. Since the system **102** is online, it can access the solution (here we assume that the original origin of the solution **124** is from an online source). If the solution identifier from the data file **126** selected by the user contains a reference to the solution **124** being accessible online, the system **102** goes online to check whether or not the online solution is newer than the stored solution **124** (block **320**). In one implementation, the system **102** compares the time stamp of the online solution with a time stamp on the stored solution **124**.

If the online solution is not newer (i.e., the "No" branch from block **320**), the system **102** proceeds to the block **314**, installing the stored solution **124**. If the online solution is newer than the stored solution **124** (i.e., the "Yes" branch from block **320**), the system **102** either replaces the stored solution **124** with the online solution or otherwise updates the older, stored solution **124**.

Downloading the Solution for Later Use

In block **322**, the architecture **100** (or the system **102** by accessing the communications network **104**) downloads a solution into a locally accessible source such as the memory **116**. The system **102** downloads this solution when the data file **126** selected by a user contains a solution identifier for a solution for which the system **102** does not have local access (such as it not being cached) or for which the system **102** has local access but the cached or stored version of the solution (the solution **124**) is older than the online version.

In either case, the system **102** has already discovered the solution identifier for the solution and computed a special name for the solution. The system **102** then downloads the solution from the online source and saves it into a folder named with the special name (block **324**). If a solution already exists in that folder, the system **102** replaces it with the newer version or otherwise updates the currently cached solution. The resulting new or updated version then being the solution **124**.

In one implementation, the system **102** saves the solution to a unique location within the system **102**'s accessible memory. The system **102** does so in cases where the system **102** is used by multiple users. By so doing, the system **102** is able to determine which of the users that use the system **102** or load files into memory locally accessible by the system **102** saved the particular solution. Also by so doing, the system **102** may provide greater security for the computer **112** and its users.

Techniques for Secure Deployment of Data File Solutions

FIG. **4** shows a process **400** for making deployment of data file solutions more secure. The process **400** is illustrated as a series of blocks representing individual operations or acts performed by the system **102**. The process **400** may be implemented in any suitable hardware, software, firmware, or combination thereof. In the case of software and firmware, the process **400** represents a set of operations implemented as computer-executable instructions stored in memory and executable by one or more processors.

Through the process **300**, discussed above, the system **102** enables a user to open and edit a data file by silently discovering and deploying the data file's solution. In the process **400**, the system **102** acts to protect the user from the solution because some solutions contain dangerous code, like viruses and worms. To help prevent dangerous code from damaging the user's files and/or computer, the system **102** sandboxes the solution, if appropriate.

As part of this security, the system **102** can be configured to ask a user during an attempt to open a data file how the user wants to sandbox the data file's solution. Many users, however, often do not know what level of sandboxing to chose, and thus the explicit prompting slows the process and consumes unnecessary user time.

To make opening and editing a data file as easy as possible and because many users do not know what level of sandboxing a solution should be run within, the system **102** can be configured to sandbox a solution automatically, as set forth in FIG. **4** and the process **400** below.

In block **402**, the system **102** determines the origin of a solution, such as the solution **124** of FIG. **1**. The system **102**, from block **304**, discovered the solution identifier from the data file **126**. With this solution identifier, the system **102** can determine the origin of the solution **124**.

The solution identifier can be a URL, a URN, or another Uniform Resource Identifier (URI). URLs give a location for a solution and URNs a name, either of which can be used to locate and find the source of a solution. URLs usually indicate a non-local, online source for a solution like a remote server accessible through the communications network **104**. URNs give the name of a solution, which typically can be accessed online (but could be accessed from a local, offline source), and are less subject to change by those in control of the solution. In either case, these solution identifiers give the system **102** the original source of the solution. The solution may be cached or otherwise stored by the system **102** in a local source (such as the solution **124** in the memory **116**), but the local source is not indicated as the solution's origin by the solution's solution identifier, the local source is a new source.

With the origin of the solution known, the document manager **122** sets the appropriate level of security for the solution **124**, sandboxing the solution **124** based on its origin (block **404**). The document manager **122** sandboxes the solution **124**, if from unknown or untrustworthy sources on the global internet with a sandbox allowing the solution **124** very little leeway in the operations it can perform, such as reading or altering other files on the computer **112**. Greater trust, and so a weaker sandbox, are used for the solution **124** if it has an origin from known and more trustworthy sources accessed remotely, such as from MSN.com or a company intranet source. Very high trust, requiring a weak or no sandbox, is used for the solution **124** if is has an origin on the computer **112**, such as when the user or another person using the user's computer created the solution **124**.

Setting security levels and appropriate use of sandboxes for online use of solutions for data files are performed by various internet-capable host applications. The document manager **122**, however, opens solutions and sandboxes them based on their origin even when the solution is opened from a local source that differs from the original origin of the solution. Typically, internet-capable host applications, such as Internet Explorer®, will not open a solution from a local source silently, but will return an error if the online copy is not available. The document manager **122**, however, opens and executes, without user interaction, solutions in appropriate sandboxes even when a solution is loaded from a local source.

In block **406**, the system **102** installs the solution **124** within an appropriate sandbox. This appropriate sandbox limits the operations that the solution **124** can perform, thereby helping to protect the computer **112** and its files from the solution **124**.

A Computer System

FIG. **5** shows an exemplary computer system that can be used to implement the processes described herein. Computer **542** includes one or more processors or processing units **544**, a system memory **546**, and a bus **548** that couples various system components including the system memory **546** to processors **544**. The bus **548** represents one or more of any of several types of bus structures, including a memory bus or memory controller, a peripheral bus, an accelerated graphics port, and a processor or local bus using any of a variety of bus architectures. The system memory **546** includes read only memory (ROM) **550** and random access memory (RAM) **552**. A basic input/output system (BIOS) **554**, containing the basic routines that help to transfer information between elements within computer **542**, such as during start-up, is stored in ROM **550**.

Computer **542** further includes a hard disk drive **556** for reading from and writing to a hard disk (not shown), a magnetic disk drive **558** for reading from and writing to a removable magnetic disk **560**, and an optical disk drive **562** for reading from or writing to a removable optical disk **564** such as a CD ROM or other optical media. The hard disk drive **556**, magnetic disk drive **558**, and optical disk drive **562** are connected to the bus **548** by an SCSI interface **566** or some other appropriate interface. The drives and their associated computer-readable media provide nonvolatile storage of computer-readable instructions, data structures, program modules and other data for computer **542**. Although the exemplary environment described herein employs a hard disk, a removable magnetic disk **560** and a removable optical disk **564**, it should be appreciated by those skilled in the art that other types of computer-readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks, random access memories

(RAMs), read only memories (ROMs), and the like, may also be used in the exemplary operating environment.

A number of program modules may be stored on the hard disk **556**, magnetic disk **560**, optical disk **564**, ROM **550**, or RAM **552**, including an operating system **570**, one or more application programs **572** (such as the document manager application **122**), other program modules **574**, and program data **576**. A user may enter commands and information into computer **542** through input devices such as a keyboard **578** and a pointing device **580**. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are connected to the processing unit **544** through an interface **582** that is coupled to the bus **548**. A monitor **584** or other type of display device is also connected to the bus **548** via an interface, such as a video adapter **586**. In addition to the monitor, personal computers typically include other peripheral output devices (not shown) such as speakers and printers.

Computer **542** commonly operates in a networked environment using logical connections to one or more remote computers, such as a remote computer **588**. The remote computer **588** may be another personal computer, a server, a router, a network PC, a peer device or other common network node, and typically includes many or all of the elements described above relative to computer **542**. The logical connections depicted in FIG. **5** include a local area network (LAN) **590** and a wide area network (WAN) **592**. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets, and the Internet.

When used in a LAN networking environment, computer **542** is connected to the local network through a network interface or adapter **594**. When used in a WAN networking environment, computer **542** typically includes a modem **596** or other means for establishing communications over the wide area network **592**, such as the Internet. The modem **596**, which may be internal or external, is connected to the bus **548** via a serial port interface **568**. In a networked environment, program modules depicted relative to the personal computer **542**, or portions thereof, may be stored in the remote memory storage device. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

Generally, the data processors of computer **542** are programmed by means of instructions stored at different times in the various computer-readable storage media of the computer. Programs and operating systems are typically distributed, for example, on floppy disks or CD-ROMs. From there, they are installed or loaded into the secondary memory of a computer. At execution, they are loaded at least partially into the computer's primary electronic memory. The invention described herein includes these and other various types of computer-readable storage media when such media contain instructions or programs for implementing the blocks described below in conjunction with a microprocessor or other data processor. The invention also includes the computer itself when programmed according to the methods and techniques described herein.

For purposes of illustration, programs and other executable program components such as the operating system are illustrated herein as discrete blocks, although it is recognized that such programs and components reside at various times in different storage components of the computer, and are executed by the data processor(s) of the computer.

Conclusion

The above-described system and method enables a user to edit data files when offline by discovering and deploying the data file's solution application. Although the invention has been described in language specific to structural features and/or methodological acts, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features or acts described. Rather, the specific features and acts are disclosed as exemplary forms of implementing the claimed invention.

The invention claimed is:

**1**. A method comprising:
receiving input to open a data file written in a mark-up language and having a solution;
discovering, without user interaction, the solution in an offline memory source;
deploying, without user interaction, the solution; and
opening the data file.

**2**. The method of claim **1**, wherein the deploying is within a sandbox.

**3**. The method of claim **1**, wherein discovering the solution includes discovering a solution identifier in the data file, computing a special name from the solution identifier, and discovering the solution using the special name.

**4**. The method of claim **1** further comprising, prior to deploying the solution;
updating the solution discovered in the offline memory source with a newer solution.

**5**. The method of claim **1**, wherein the data file includes primarily data.

**6**. The method of claim **1**, wherein the solution includes a presentation application.

**7**. The method of claim **1**, wherein the solution includes a logic application.

**8**. The method of claim **1**, wherein opening the data file is performed with the solution and produces an electronic form.

**9**. A computer-readable medium comprising computer-executable instructions that perform the method of claim **1** when executed by a computer.

**10**. The method of claim **1**, wherein the mark-up language is XML.

**11**. A method comprising:
receiving input to open a data file having a solution previously received from an online memory source;
discovering a solution identifier in the data file;
computing a special name corresponding to the solution identifier;
searching local memory for the special name; and
installing the solution found in a folder in the local memory and having the special name.

**12**. The method of claim **11**, further comprising:
opening the data file using the installed solution.

**13**. The method of claim **11**, wherein the special name is unique.

**14**. A computer-readable medium comprising computer-executable instructions that perform the method of claim **11** when executed by a computer.

**15**. The method of claim **11**, wherein the data file is written in a mark-up language.

**16**. The method of claim **15**, wherein the mark-up language comprises XML.

**17**. An apparatus comprising:
means for displaying a representation of a data file governed by a solution application received from an online memory source;
means for selecting the data file;
means for discovering and deploying, without user interaction, the solution application governing the data file from an offline memory source;

means for displaying an electronic form representing a product of the solution application and the data file;

means for enabling a user to enter information into the electronic form;

means for receiving information entered into the electronic form; and

means for altering the data file to reflect the information received.

**18**. The apparatus of claim **17**, wherein the data file is written in a mark-up language.

**19**. The apparatus of claim **18**, wherein the mark-up language comprises XML.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

# CERTIFICATE OF CORRECTION



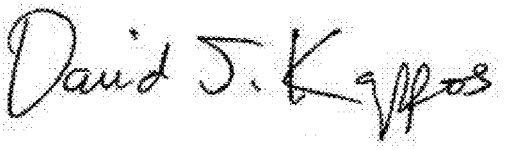
PATENT NO. : 7,490,109 B1
APPLICATION NO. : 11/276585
DATED : February 10, 2009
INVENTOR(S) : Prakash Sikchi et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In column 3, line 33, after "screen," insert -- a --.

In column 12, line 23, in Claim 4, delete "solution;" and insert -- solution: --, therefor.

Signed and Sealed this
Third Day of May, 2011



David J. Kappos
*Director of the United States Patent and Trademark Office*